

CONFIDENTIAL INFORMATION

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Overview of results from content and leaching assessments on Terra XPS®.

Results from content and leaching assessments have been performed on typical samples of Terra XPS® and cannot be used as specifications.

Assessments done by Intron (Ref: Intron, A827300, October 2005))

Content assessment

Methods of analysis: mentioned in Intron report (can be supplied on request)

Table 1: Results of content assessment by Intron, 2005

Analysis	Unit	Terra XPS®	Terra XPS®
Anorganic components			
Arsenic	mg/kg d.s.	<3	
Cadmium	mg/kg d.s.	<0.2	
Chromium	mg/kg d.s.	<4	
Copper	mg/kg d.s.	<2	
Mercury	mg/kg d.s.	<0.05	
Lead	mg/kg d.s.	<5	
Nickel	mg/kg d.s.	<2	
Zinc	mg/kg d.s.	<6	
Organic components – PAH's			
Naphthalene	mg/kg d.s.	2.9*	0.05**
Fenanthrene	mg/kg d.s.	0.31*	0.07**
Antracene	mg/kg d.s.	<0.10*	0.08**
Fluoranthene	mg/kg d.s.	<0.10*	<0.02**
Benzo(a)anthracene	mg/kg d.s.	<0.10*	<0.02**
Chrysene	mg/kg d.s.	<0.10*	<0.02**
Benzo(k)fluoranthene	mg/kg d.s.	<0.10*	0.11**
Benzo(a)pyrene	mg/kg d.s.	<0.10*	0.20**
Benzo(g,h,i)perylene	mg/kg d.s.	<0.10*	<0.02**
Indeno(1,2,3-c,d)pyrene	mg/kg d.s.	<0.10*	<0.02**
Acenaphthylene	mg/kg d.s.		<0.02**
Acenaphthene	mg/kg d.s.		0.06**
Fluorene	mg/kg d.s.		0.02**
Pyrene	mg/kg d.s.		<0.02**
Benzo(b)fluoranthene	mg/kg d.s.		0.13**
Dibenz(a,h)anthracene	mg/kg d.s.		0.02**
Total PAH's (VROM)	mg/kg d.s.	3.8	
Total PAH's (16 EPA)	mg/kg d.s.		0.80
Organic components - others			
Benzene	mg/kg d.s.	<0.05	
Toluene	mg/kg d.s.	<0.05	

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Analysis	Unit	Terra XPS®	Terra XPS®
Ethylbenzene	mg/kg d.s.	<0.05	
m+p-Xylene	mg/kg d.s.	<0.05	
o-Xylene	mg/kg d.s.	<0.05	
Total xylenes	mg/kg d.s.	<0.07	
BETX (Benzene, Ethylbenzene, Toluene, Xylenes)	mg/kg d.s.	<0.18	
Phenol	mg/kg d.s.	<0.75	
EOX	mg/kg d.s.	4.0	

<: below detection limit

*: AP04 extraction, analysed with HPLC

**: Soxhlet extraction, analysed with GCMS

Leaching assessment

Test method: NEN 7343.1995

L/S ratio = 10 (ml/g)

Assumptions of application:

- Amount rain per year: 300 mm
- Duration of application: 100 year
- Height of application: 20 cm

Table 2: Results of leaching assessment by Intron, 2005

Analysis	Unit	Emission Terra XPS®
Anorganic components		
Antimony	mg/kg d.s.	< 0.02
Arsenic	mg/kg d.s.	< 0.25
Barium	mg/kg d.s.	0.12
Cadmium	mg/kg d.s.	< 0.005
Chromium	mg/kg d.s.	< 0.05
Cobalt	mg/kg d.s.	< 0.05
Copper	mg/kg d.s.	< 0.05
Mercury	mg/kg d.s.	< 0.0015
Lead	mg/kg d.s.	< 0.1
Molybdenum	mg/kg d.s.	< 0.025
Nickel	mg/kg d.s.	< 0.05
Selenium	mg/kg d.s.	< 0.02
Tin	mg/kg d.s.	< 0.075
Vanadium	mg/kg d.s.	< .01
Zinc	mg/kg d.s.	< 0.2
Organic components		
Fluoride	mg/kg d.s.	< 1
Chloride	mg/kg d.s.	1.8
Sulphate	mg/kg d.s.	5.9
Bromide	mg/kg d.s.	< 0.5

<: below detection limit

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Assessment done by SP Swedish National Testing and Research Institute (Ref: P4 0481, October 2005)

Methods of analysis: mentioned in SP report (can be supplied on request).

Table 3: Results of content assessment by SP, 2005

Analysis	Unit	Terra XPS®
Arsenic (As)	mg/kg	<5
Cadmium (Cd)	mg/kg	<0.4
Cobalt (Co)	mg/kg	<1
Chromium (Cr)	mg/kg	<2
Copper (Cu)	mg/kg	<1
Nickel (Ni)	mg/kg	<1
Lead (Pb)	mg/kg	<2
Vanadium (V)	mg/kg	<2
Zinc (Zn)	mg/kg	<5
Mercury (Hg)	mg/kg	<0.02
PCA ⁺	(weight-%)	<0.2

PCA⁺ consists of a number of polycyclic aromatics which also include PAH. Concentration expressed as phenanthrene equivalents.

Assessment done by ISA Sport (Ref: 25050006, March 2005)

From the test results of ISA Sport it is concluded that the rubber granulate Terra XPS® meets the requirements from the DIN 18035-7 standard for the DOC, EOX, toxicity and heavy metals content.

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Test results environmental research

The results for the DOC, EOX and toxicity research of the rubber granulate are given in table 2.
The results for the heavy metals research are listed in table 3.

Table 2: DOC, EOX and toxicity

Characteristic	Result	Standard
DOC	5.9 mg/l	≤ 20 mg/l
EOX	< 10 mg/kg	≤ 100 mg/kg
Toxicity	0%	≤ 50%

From the results listed in table 2 it is concluded that the rubber granulate "Terra XPS" meets the requirements from the DIN 18035-7 standard for the DOC, EOX and toxicity.

Table 3: Pb, Cd, Cr, Hg, Zn and Sn content in eluate

Metal	Result [µg/l]	Standard [µg/l]
Lead (Pb)	< 5	≤ 40
Cadmium (Cd)	0.1	≤ 5
Chromium (Cr)	< 2	≤ 50
Mercury (Hg)	< 0.03	≤ 1
Zinc (Zn)	34	≤ 3000
Tin (Sn)	< 15	≤ 50

From the results listed in table 3 it is concluded that the rubber granulate "Terra XPS" meets the requirements from the DIN 18035-7 standard for the heavy metals content.